Betriebsanleitung • Operating Instructions

Economy-Pumpstand
Turbo-Drag-Pumpstand

Economy Pumping Station
Turbo-Drag Pumping Station

TSH 071 E
→ TSU 071 E

PT 0067 BN/C (0708)

PFEIFFER VACUUM

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Please note: Current operating instructions are available via www.pfeiffer-vacuum.net

1. Safety Instructions

☞ **Read and follow all instructions in this manual.**

☞Inform yourself regarding:

- Hazards which can be caused by the pumping station;
- Hazards which can be caused by your system;
- Hazards which can be caused by the medium being pumped.

☞ Avoid exposing any part of the body to vacuum.

☞ Observe the safety and accident prevention regulations.

☞ Regularly check that all accident prevention measures are being complied with.

☞ Do not operate the turbo pumping station with open high vacuum flange.

☞ Use at least 4 bracket screws to connect the high vacuum flange (ISO flange).

☞ Do not disconnect the plug between the TC 600 and accessory components during operations.

☞ During operations temperatures of up to 65 °C can arise in the lower part of the turbopump. Take care to avoid burns!

☞ The unit has been accredited protection class IP 30. When the unit is operated in environments which require other protection classes, the necessary measures must be taken.

☞ Do not carry out any unauthorised conversions or alterations to the turbo pumping station.

☞ When returning individual components please observe the shipping instructions (refer to the operating instructions for the pumping station components).

1.1. For Your Orientation

In the text

➡ Working instruction: here, you have to do something.

Symbols used

The following symbols are used throughout in illustrations.

- Ⓗ High vacuum flange
- Ⓥ Fore-vacuum flange
- ⊕ Air cooling
- Ⓖ Sealing gas connection
- Ⓕ Venting connection
- Ⓔ Electric connection / Electronic drive unit

Abbreviations used

DCU = Display and Operating unit

TC = Electronic drive unit, turbopump

TPS = Power unit

1.2. Pictogram Definitions

Danger of personal injury.

Danger of damage to the pumping station or to the system.

Danger of injury from rotating parts.

Danger of burns from touching hot parts.

Attention to particulary important information on the product, handling the product or to a particular part of the documentation.

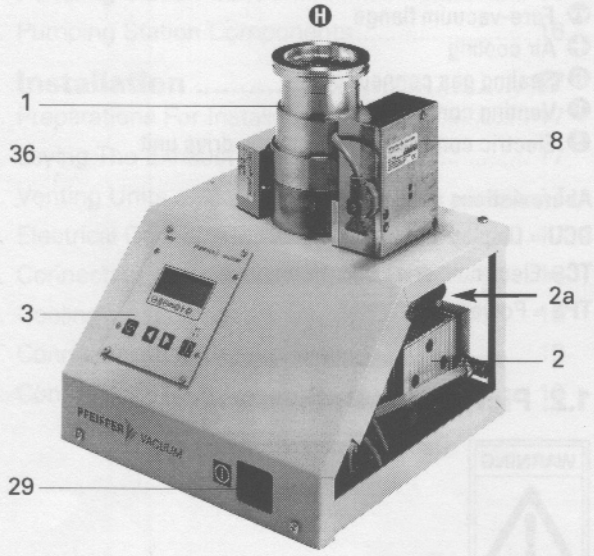
Modifications reserved.

2. Understanding The Pumping Station

2.1. Main Features

Turbomolecular Drag Pumping Station TSH 071 E

1 Turbomolecular Drag Pump TMH 071 P
2 Diaphragm Pump MVP 015-2
2a ON/OFF mains switch diaphragm pump
3 Display And Operating Unit DCU 001
8 Electronic Drive Unit TC 600
29 ON/OFF Pumping Station (located internally)
36 Air Cooling



The pumping stations are of plug and play type and are fully automatic operating pumping units.

The mains cable is not included with the delivery consignmet and must therefore be ordered separately (see "Accessories").

The pumping station can be supplied with or without the Display And Operating Unit DCU 001. The Display And Operating Unit DCU 001 serves to control and monitor the pumping station. The DCU can be detached from the pumping station and operated with the 3 m long connecting cable as a remote control and which is included with the delivery.

Cooling

Standard: Air cooling (range from 5 to 35 °C ambient temperature)
Alternative: Water cooling (Accessory)

Proper Use

- The turbomolecular pumping stations may only be used for the purpose of generating vacuum.
- The turbomolecular pumping stations may only be operated in the configuration shown.

Improper Use

The following, inter alia, is regarded as improper:

- The pumping of corrosive or explosive gases,
- Operating the pumping stations in areas where there is a danger of explosion,
- Operating in surroundings which require a protection type superior to IP 30,
- The use of accessory parts not named in these operating instructions or which have not been agreed with the manufacturer.

Improper use will cause all guarantees and liability claims to be null and void.

2.2. Pumping Station Control

Pumping station	High vacuum flange, Pumping station control[1)]
PM S03 520	DN 63 ISO-K, TC 600, TPS 100
PM S03 521	DN 63 CF-F, TC 600, TPS 100
PM S03 522	DN 40 ISO-KF, TC 600, TPS 100
PM S03 525	DN 63 ISO-K, TC 600, TPS 100, DCU 001
PM S03 526	DN 63 CF-F, TC 600, TPS 100, DCU 001
PM S03 527	DN 40 ISO-KF, TC 600, TPS 100, DCU 001

[1)] Alteration to the operating parameters with the DCU 001 possible.

Accessory connection to

TC 600:
Air cooling
Venting Valve TVF 005
Turbopump heating

DCU 001 :
Pressure gauges (see Accessories)

2.3. Pumping Station Componets

Pumping stations	TSH / TSU 071 E	Operating Instructions
Pumping station componets		
Turbomolecular Drag-Pump with Electronic Drive Unit TC 600	TMH / TMU 071 P	PM 0504 BN
Diaphragm Vacuum Pump	MVP 015-2	PU 0012 BN
Power Unit	TPS 100	PM 0521 BN
Air cooling		PM 0543 BN
Display And Operating Unit	DCU 001	PM 0477 BN, PM 0547 BN

3. Installation

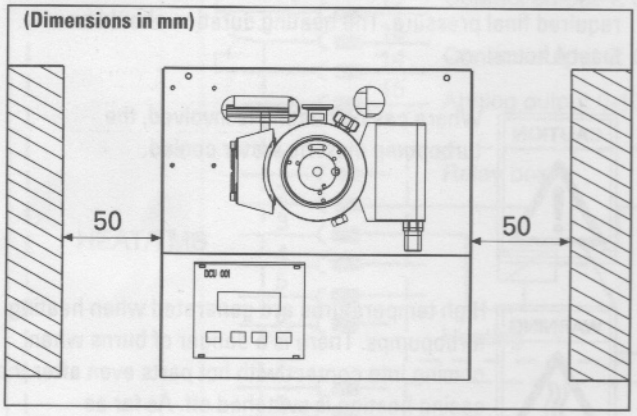
3.1. Preparations For Installation

WARNING

Do not carry out any unauthorized modifications or alterations to the turbo pumping station.

– The lubricant reservoir on turbopumps is fitted and filled ready for operation.

➡ Only remove the blank flange on the high vacuum side immediately before connecting.
➡ Pay attention to the permissible magnetic field ≤ 3 mT.
➡ Set up the pumping station on a horizontal surface.
➡ Remove transportation package from the diaphragm pump.
➡ In order to avoid the build-up of heat when operating the pumping station, the minimum distances to walls and adjacent units should be observed (as shown in the following illustration).



3.2. Fitting The Exhaust Line

CAUTION

When fitting the exhaust line take account of the instructions in the operating instructions for the backing pump.

WARNING

The exhausted process gases and vapours can represent a health hazard and can also be environmentally damaging. Comply with all the gas manufacture's safety instructions.

3.3. Venting Units

Turbomolecular Drag Pumps TMH/TMU 071 P can be vented manually with the venting screw (condition on delivery).

CAUTION

For information to possible venting modes refer to the operating instructions of the turbopump.

Venting Valve TVF 005 (Accessory)

The Venting Valve TVF 005 can be used in conjuction with the TC 600 to vent the TMH/TMU 071 P. Control is via the setting which has been pre-selected on the Electronic Drive Unit TC 600.
The venting mode on the TVF 005 is selectable via the DCU 001.

➡ For information to the installation of the venting valve refer to the operating instructions of the turbopump.

3.4. Electrical Connection

CAUTION

The electrical connection should be carried out in accordance with local regulations. Alternating current is required to operate the pumping station.

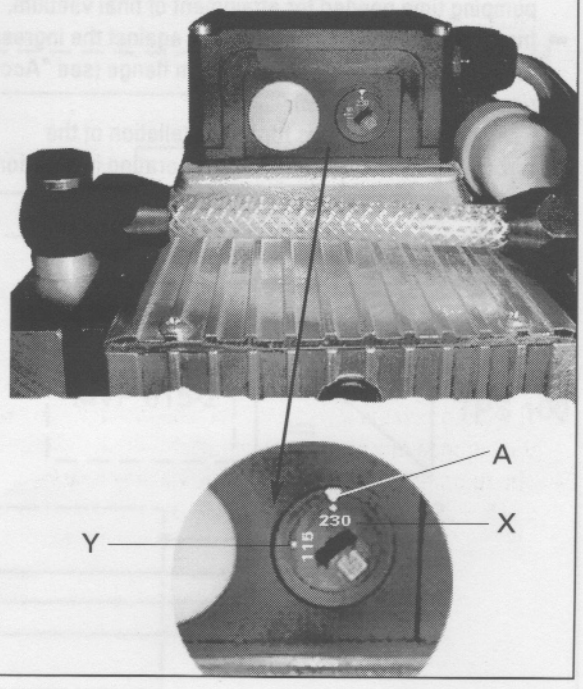
Change-over the voltage selection switch

The diaphragm pump has a change-over single phase wide range motor.

➡ Before the installation of the pumping station the local mains voltage must be ascertained.
➡ Using a suitable screwdriver set the voltage change-over (on the diaphragm pump terminal box cover) to the range of mains voltage available (see the adjacent illustration). Works setting: X = 230 (voltage range 190 - 260 V)

Voltage change-over switch on the diaphragm pump

A Setting marking
X Setting "230" voltage range 190-260V; 50/60 Hz
Y Setting "115" voltage range 90-127V; 50/60 Hz



Only change the voltage range on the diaphragm pump when the pumping station is disconnected from the mains.

Always check the set voltage range before switching on the pumping station.

➡ Plug in the mains plug (the mains connection cable for the pumping station is not included in the delivery consignment, see "Accessories").
➡ The pumping station can now be operated.

Accessory Connections
The electrical connection of the accessories:
See 3.8. Connections Diagram.

3.5. Connecting The Vacuum System

The weight of a vacuum chamber freely flanged onto the vacuum flange must not exceed 200 N (corresponds to 20 kg). No unilateral loading on the high vacuum flange.

Maintain maximum cleanliness when fitting all high vacuum parts. Unclean components prolong the pumping time.

➡ Only remove the blank cover on the high vacuum flange when the apparatus is ready for connection so that no moisture can precipate in the pump; this would prolong the pumping time needed for attainment of final vacuum.
➡ Insert splinter shield for protection against the ingress of foreign particles in the high vacuum flange (see "Accessories" for the turbopump).
➡ Remark the instructions for the installation of the turbopump. Refer to the relevant operating instructions.

3.6. Cooling

The pumping stations are equipped with air cooling as standard; this can be used up to an ambient temperature of 35 °C. If required, a change to water cooling is possible.

Where operations involve casing heating and/or gas loads, water cooling is necessary (see "Accessories").

3.7. Connecting The Casing Heating

Only valid for the turbopump TMU 071 P with stainless-steel housing and CF-F flange.

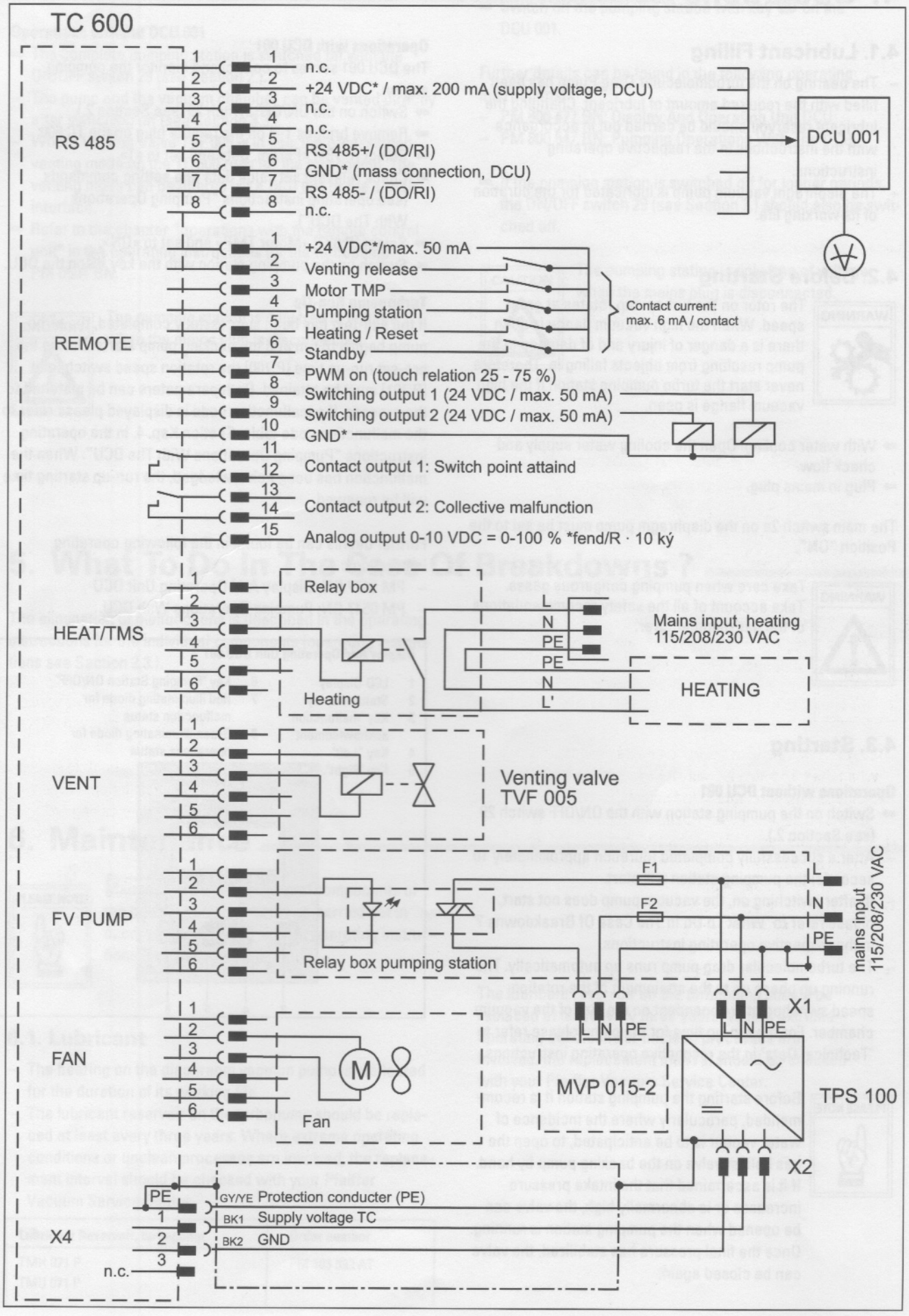
In order to accelerate the attainment of final pressure, turbopumps and vacuum chambers can be heated. The heating duration is dependent on the degree of contamination and the required final pressure. The heating duration should be at least 4 hours.

Where casing heating is involved, the turbopump must be water cooled.

High temperatures are generated when heating turbopumps. There is a danger of burns when coming into contact with hot parts even after the casing heating is switched off. As far as possible, thermally insulate the heating sleeve and pump casing during installation. When heating, do not touch the pump casing and heating sleeve.

The relay box of the casing heater can be secured to the pumping station casing with 4 screws M4 (see also Section 8.1. Dimensions). For details of the casing heating and its installation please refer to the relevant operating instructions (see "Accessories").

3.8. Connections Diagram



4. Operations

4.1. Lubricant Filling

- The bearing on the turbomolecular Drag Pump has been filled with the required amount of lubricant. Changing the lubricant reservoir should be carried out in accordance with the instructions in the respective operating instructions.
- The diaphragm vacuum pump is lubricated for the duration of its working life.

4.2. Before Starting

The rotor on the turbopump rotates at great speed. When the high vacuum flange is open there is a danger of injury and of damage to the pump resulting from objects falling in. Therefore never start the turbo pumping station if the high vacuum flange is open.

➡ With water cooling: Open the cooling water supply and check flow.
➡ Plug in mains plug.

The main switch 2a on the diaphragm pump must be set to the Position "ON".

Take care when pumping dangerous gases. Take account of all the safety recommendations of the gas manufacturer.

4.3. Starting

Operations without DCU 001

➡ Switch on the pumping station with the ON/OFF switch 29 (see Section 2.).
- After a successfully completed (duration approximately 10 seconds) the pumping station will start.
- If, after switching on, the vacuum pump does not start, please refer to "What To Do In The Case Of Breakdowns ?" in the respective operating instructions.
- The turbomolecular drag pump runs up automatically. The running up phase up to the attainment of the rotation speed switchpoint is dependent on the size of the vacuum chamber. For the run-up time for the pump please refer to "Technical Data" in the respective operating instructions.

Before starting the pumping station it is recommended, particularly where the incidence of water vapour is to be anticipated, to open the gas ballast valve on the backing pump by hand. If it is ascertained that the intake pressure increases or is abnormally high, the valve can be opened when the pumping station is running. Once the final pressure has stabilized, the valve can be closed again.

Operations with DCU 001

The DCU 001 serves to control and monitor the pumping station.

➡ Switch on the ON/OFF switch 29 (see Section 2.).
➡ Remove bridges 1–4 on the remote plug on the TC 600.
➡ Select [P:794] «Param. Set» and set to «1».
➡ Check relevant set value data and setting commands (see operating instructions "Pumping Operations With The DCU").
➡ Select [P:023] «Motor TMP» and set to «ON».
➡ Switch on the pumping station with the key ⏻ on the DCU.

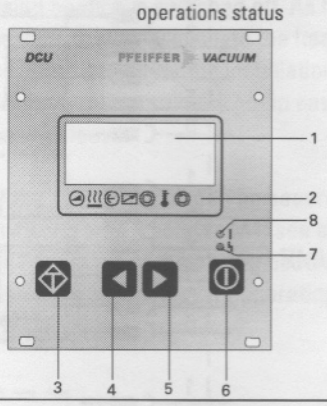
Turbopump Run-Up

If the self-test has been successfully completed, the turbopump begins to run and the backing pump starts. During the pre-set run-up time [P:700] the rotation speed switchpoint [P:701] must be attained. Both parameters can be matched to the process. If a malfunction code is displayed please refer to the malfunction code table, Section Kap. 4. in the operating instructions "Pumping Operations With The DCU". When the malfunction has been acknowledged, the run-up starting time will be renewed.

Further details can be found in the following operating instructions:
- PM 0477 BN; Display And Operating Unit DCU
- PM 0547 BN; Pumping Operations With DCU.

Display And Operating Unit DCU 001

1 LCD Display
2 Status display
3 Key "malfunction acknowledment"
4 Key "Left"
5 Key "Right"
6 Key "Pumping Station ON/OFF"
7 Red illuminating diode for malfunction status
8 Green illuminating diode for operations status



4.4. Switching OFF

Operations without DCU 001

➡ The complete pumping station is switched off with the ON/OFF switch 29 (see Section 2.).

– The pump and the vacuum chamber can be vented directly after switching off (see Section 3.3.).

– Where Venting Valve TVF 005 is in use, the preassigned venting mode on the TC 600 runs for the turbopump. The venting mode can be altered via a DCU 001 or the serial interface.

➡ Refer to the chapter "operations with the remote control unit" in the operating instructions for the turbopump PM 0504 BN.

The pumping station is only free of voltage when the mains plug is disconnected.

Operations With DCU 001

➡ Switch off the pumping station with key ⏻ on the DCU 001.

Further details can be found in the following operating instructions:

– PM 800 477 BN; Display And Operating Unit DCU

– PM 800 547 BN; Pumping Operations With The DCU.

➡ If the pumping station is switched off for longer periods, the ON/OFF switch 29 (see Section 2.) should also be switched off.

The pumping station is only free of voltage when the mains plug is disconnected.

5. What To Do In The Case Of Breakdowns ?

The elimination of malfunctions is described in the operating instructions for the individual components (operating instructions see Section 2.3.).

6. Maintenance

Maintenance of the individual components of the pumping station should be carried out in accordance with the relevant operating instructions (see Section 2.3.).

6.1. Lubricant

– The bearing on the diaphragm vacuum pump is lubricated for the duration of its working life.

– The lubricant reservoir on the turbopump should be replaced at least every three years. Where extreme operating conditions or unclean processes are involved, the replacement interval should be checked with your Pfeiffer Vacuum Service Center.

Lubricant Reservoir, turbopump	Order number
TMH 071 P TMU 071 P	PM 103 593 AT

The lubricant reservoir on the turbopump should be replaced at least every three years. Where extreme operating conditions or unclean processes are involved, the replacement interval should be checked with your Pfeiffer Vacuum Service Center.

7. Service

Do make use of our service facilities
In the event that repairs are necessary on your pumping station a number of options are available to you to ensure any system down time is kept to a minimum:
- Have the pump repaired on the spot by our Pfeiffer Vacuum Service Engineers.
- Return individual components to the manufacturer for repairs.
- Replace individual components.

Local Pfeiffer Vacuum representatives can provide full details.

Before returning:
➡ Please attach a clearly visible notice "Free of harmful substances" (both on the unit and also on the delivery note and any accompanying letters).

"Harmful substances" are substances and preparations as defined in the current, local, dangerous substances regulations; in the U.S.A. as "materials in accordance with the Code of Federal Regulations (CFR) 49 Part 173.240 Definition and Preparation". We will carry out the decontamination and invoice this work to you if you have not attached this note. This also applies where the operator does not have the facilities to carry out the decontamination work. Units which are contaminated microbiologically, explosively or radioactively cannot be accepted as a matter of principle.

Fill out the declaration of contamination
➡ In every case the "Declaration of Contamination" must be completed diligently and truthfully.
➡ A copy of the completed declaration must accompany the unit; any additional copies must be sent to your local Pfeiffer Vacuum Service Center.

Please get in touch with your local Pfeiffer Vacuum representatives if there are any questions regarding contamination.

Decontaminate units before returning or possible disposal. Do not return any units which are microbiologically, explosively or radioactively contaminated.

Returning contaminated units
If contaminated have to be returned for maintenance/repair, the following instructions concerning shipping must be followed:
➡ Neutralise the pump by flushing with nitrogen or dry air.
➡ Seal all openings to the air.
➡ Seal pump or unit in suitable protective foil.
➡ Ship units only in appropriate transport containers.

Repair orders are carried out according to our general conditions of sale and supply. If repairs are necessary, please send the pump to your nearest Pfeiffer Vacuum Service Center.

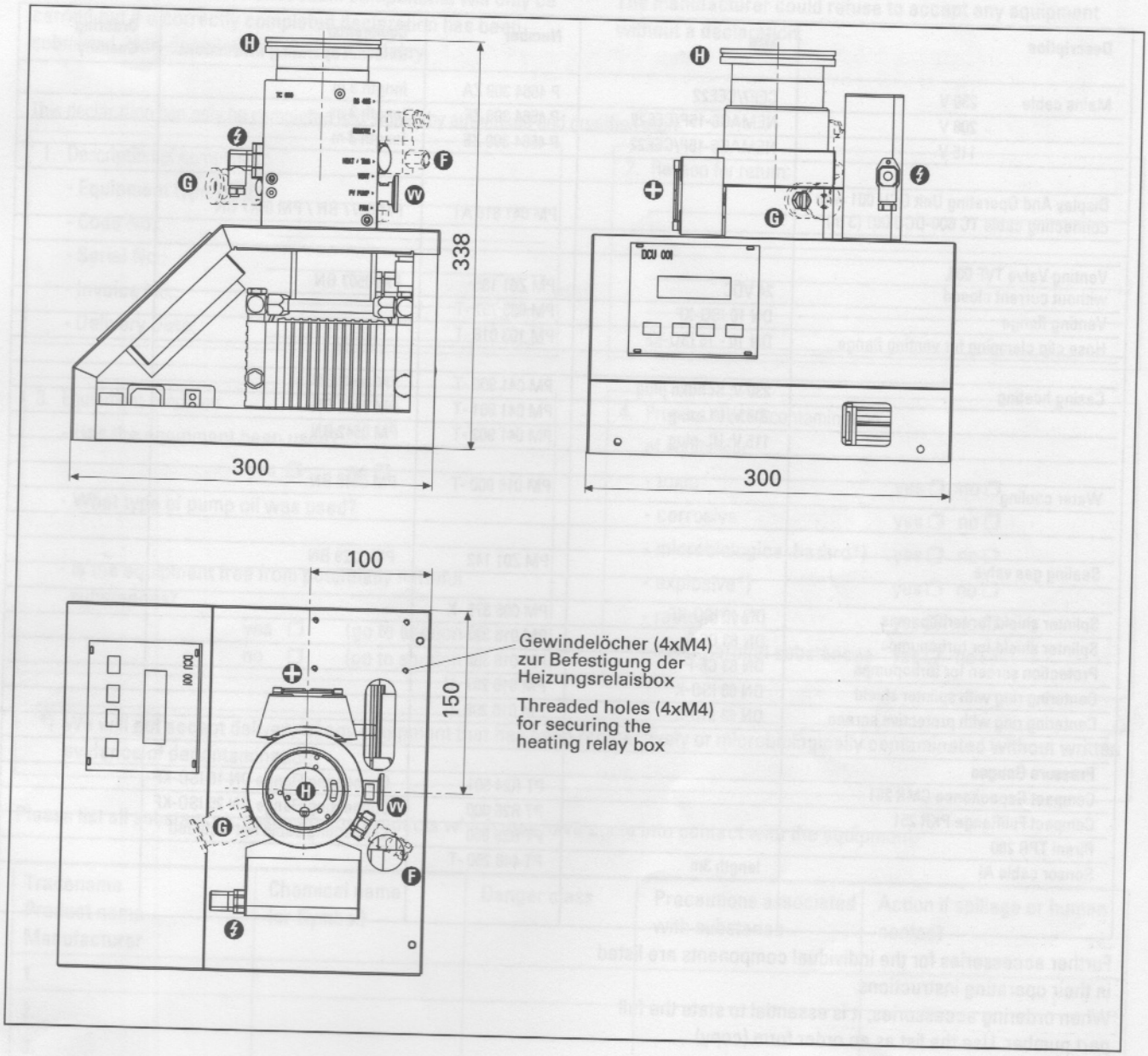
8. Technical Data

Pumping Station	Unit	TSH 071 E	TSH 071 E TSU 071 E
Connection, nominal diameter		DN 40 ISO-KF	DN 63 ISO-K DN 63 CF-F
Volume flow rate for			
Nitrogen N_2	l/s	33	59
Helium He	l/s	39	50
Hydrogen H_2	l/s	32	45
Compression rate			
N_2		$> 10^{11}$	
He		$6 \cdot 10^6$	
H_2		$> 10^5$	
Final pressure	mbar	$< 10^{-8}$	
Start-up time	min	2	
Working range			
from	mbar	1000	
to	mbar	$< 1 \cdot 10^{-7}$	$< 1 \cdot 10^{-9}$
Backing pump volume flow rate			
at 10 mbar 50 Hz	l/min	3,8	
60 Hz	l/min	4,4	
Duration-/max. power[1]	W	100/110	
Mains connection	VAC	90-132/ 185-265	
Weight	kg	15	15/16

Please refer to the relevant operating instructions for technical data on the individual components (see Section 2.3.).

1) With maximum gas throughput.

8.1. Dimensions



9. Accessories

Description	Size	Number	Comments/ Relevant operating instructions	Ordering Quantity
Mains cable 230 V	CEE7/CEE22	P 4564 309 ZA	length 3 m	
208 V	NEMAG6-15P/CEE22	P 4564 309 ZF	length 3 m	
115 V	NEMAG5-15P/CEE22	P 4564 309 ZE	length 3 m	
Display And Operating Unit DCU 001 with connecting cable TC 600-DCU 001 (3 m)		PM 041 816 AT	PM 0477 BN / PM 0547 BN	
Venting Valve TVF 005, without current closed	24 VDC	PM Z01 135	PM 0507 BN	
Venting flange	DN 10 ISO-KF	PM 033 737 -T		
Hose clip clamping for venting flange	DN 10 - 16 ISO-KF	PM 103 016 -T		
Casing heating	230 V; Schuko plug	PM 041 900 -T	PM 0542 BN	
	208 V; UL-plug	PM 041 901 -T	PM 0542 BN	
	115 V; UL-plug	PM 041 902 -T	PM 0542 BN	
Water cooling		PM 016 000 -T	PM 0546 BN	
Sealing gas valve		PM Z01 142	PM 0229 BN	
Splinter shield for turbopumps	DN 40 ISO-KF	PM 006 375 -X		
Splinter shield for turbopumps	DN 63 CF-F	PM 016 312		
Protection screen for turbopumps	DN 63 CF-F	PM 016 333		
Centering ring with splinter shield	DN 63 ISO-K	PM 016 207 -U		
Centering ring with protective screen	DN 63 ISO-K	PM 016 208 -U		
Pressure Gauges				
Compact Capacitance CMR 261		PT R24 501	Connecting Flange DN 16 ISO-KF	
Compact FullRange PKR 251		PT R26 000	Connecting Flange DN 25 ISO-KF	
Pirani TPR 280		PT R26 950	Connecting cable not included	
Sensor cable AI	length 3m	PT 448 250 -T		

Further accessories for the individual components are listed in their operating instructions.
When ordering accessories, it is essential to state the full part number. Use the list as an order form (copy).

10. Spare Parts

The spare parts for the individual components can be found in the respective operating instructions (see Section 2.3.).

Declaration of Contamination of Vacuum Equipment and Components

The repair and/or service of vacuum components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay.

The manufacturer could refuse to accept any equipment without a declaration.

This declaration can only be completed and signed by authorised and qualified staff:

1. Description of component:
   - Equipment type/model: _____
   - Code No.: _____
   - Serial No.: _____
   - Invoice No.: _____
   - Delivery Date: _____

2. Reason for return:
   _____
   _____
   _____
   _____
   _____

3. Equipment condition
   - Has the equipment been used?
     yes ❒ no ❒
   - What type of pump oil was used?
     _____
   - Is the equipment free from potentially harmful substances?
     yes ❒ (go to section 5)
     no ❒ (go to section 4)

4. Process related contamination of equipment
   - toxic yes ❒ no ❒
   - corrosive yes ❒ no ❒
   - microbiological hazard*) yes ❒ no ❒
   - explosive*) yes ❒ no ❒
   - radioactive*) yes ❒ no ❒
   - other harmful substances yes ❒ no ❒

*) We will not accept delivery of any equipment that has been radioactively or microbiologically contaminated without written evidence of decontamination!

Please list all substances, gases and by-products which may have come into contact with the equipment:

Tradename Product name Manufacturer	Chemical name (or Symbol)	Danger class	Precautions associated with substance	Action if spillage or human contact
1.				
2.				
3.				
4.				
5.				

5. Legally Binding Declaration

I hereby declare that the information supplied on this form is complete and accurate. The despatch of equipment will be in accordance with the appropriate regulations covering Packaging, Transportation and Labelling of Dangerous Substances.

Name of Organisation: _____

Address: _____ Post code: _____

Tel.: _____

Fax: _____ Telex: _____

Name: _____

Job title: _____

Date: _____ Company stamp: _____

Legally binding signature: _____

CE Declaration of conformity

pursuant to the following EU directives:

- **Machinery 98/37/EG (Anhang II A)**
- **Electromagnetic Compatibility 89/336/EEC**
- **Low Voltage 2006/95/EEC**

We hereby certify, that the product specified below is in accordance with the provision of EU Machinery Directive **98/37/EEC**, EU Electromagnetic Compatibility Directive **89/336/EEC** and der EU Low Voltage Directive **2006/95/EEC**.

TSH 071 E
TSU 071 E

Guidelines, harmonised standards, national standards in languages and specifications which have been applied:

EN 1012-2	EN 12100-1	EN 12100-2	EN 294
EN 50081-1	EN 50082-1	EN 55011	EN 61010
IEC 801 1-4	VDE 0843-6		

Signatures / Unterschriften:

Pfeiffer-Vacuum GmbH
Berliner Strasse 43
35614 Asslar
Germany

(M. Bender)
Managing Director
Geschäftsführer

(Dr. M. Wiemer)
Managing Director
Geschäftsführer

Konf/Herst/2007

PFEIFFER VACUUM

Vacuum is nothing, but everything to us!

Turbopumps

Rotary vane pumps

Roots pumps

Dry compressing pumps

Leak detectors

Valves

Components and feedthroughs

Vacuum measurement

Gas analysis

System engineering

Service

PFEIFFER VACUUM

Pfeiffer Vacuum Technology AG · Headquarters/Germany
Tel. +49-(0) 64 41-8 02-0 · Fax +49-(0) 64 41-8 02-2 02 · info@pfeiffer-vacuum.de · www.pfeiffer-vacuum.net

The Pump Works 800-975-7867